

Tips on How to Recognize and Minimize the Occurrence of Blossom-End Rot, Tipburn, and Internal Brown Spot

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Blossom-end rot, tipburn, and internal brown spot market disorders are prevalent in a large number of high value vegetable crops, including tomato, pepper, eggplant, lettuce, cauliflower, and potato. In some cases, declines in marketable yield and profit due to these disorders are severe. Although edible, crops with a high incidence of these defects do not pass the “beauty contest” that vegetable crops must survive in order to be considered marketable. These disorders are referred to as “physiological” because they are not caused by another organism (as in a disease). They are also different from many diseases in another respect. Unlike many diseases, once physiological disorders are detected, they are often difficult or impossible to correct. This article describes the appearance and causes of blossom-end rot, tipburn, and internal brown spot. Tips on how to minimize their occurrence are also presented.

Recognizing the Disorders. *Blossom-end rot (BER)* refers to dry sunken lesions found on the blossom end (opposite end to where the fruit attaches to the stem) of tomato, pepper, or eggplant fruit



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(see Figure 1). BER lesions are usually dark, leathery, firm and dry but may be covered with secondary growth of mold or fungus. Water-soaked areas at the blossom end of the fruit are often the first symptom of BER. Lesions enlarge as fruit develop and are often the point of entry for disease organisms, leading to fruit breakdown. The disorder may occur at any time in the season but tends to occur more frequently in the earliest fruit set. *Tipburn* is a term used to describe brown-black lesions seen at the edges of leaves or other harvested portions of vegetable crops such as lettuce, cabbage, cauliflower, and broccoli (see Figure 2). Tipburn occasionally resembles some foliar disease and insect feeding

symptoms. Therefore, it is important to examine the crop and rule out that the lesions are not caused by diseases or insects. Tipburn lesions may also begin during various stages of crop development but are most common and problematic when appearing soon before harvest. *Internal brown spot (IBS)* refers to brown flecks of tissue scattered throughout the internal flesh of potato tubers (see Figure 3). There is some debate around the use of the terms internal brown spot, internal heat necrosis, and brown center – most of the



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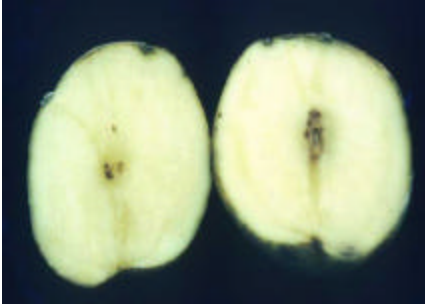


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confusion centers on where the lesions occur and their cause. Nevertheless, IBS lesions are usually internal to the vascular ring which surrounds the tuber a fraction of an inch beneath the skin. IBS lesions are typically tan, roughly circular, and approximately 1/8 of an inch in diameter. BER, tipburn, and IBS lesions may have slightly different appearances but their underlying cause appears to be the same: cell death. It is generally true that tan-dark lesions not caused by another organism (i.e., insect, disease) signify that cells have died in the discolored area. The technical term for this is necrosis. How or why do these necrotic lesions form?

Causes of the Disorders. Although studied intensively, the exact causes of BER, tipburn, and IBS are not completely known. However, two related factors appear to underlie development of the disorders. Nutrient and/or water deficiencies are usually associated with BER, tipburn, and IBS. Growing leaves, for example, inside developing heads of cabbage or lettuce, or immature fruit or tubers may not receive enough water or nutrients (particularly calcium). Interruptions in the water or calcium supply to young tissues may cause localized areas of cell death – necrotic areas which later show up as BER, tipburn, or IBS.

The roles and movement of calcium in plants and its association with physiological disorders will be described in detail in a later article. At this time, let's focus on two facts. One, calcium moves primarily in the plant's transpiration stream, that is the channels carrying water to various plant parts. So, any factor which influences the transpiration stream will affect the movement of calcium in a plant. This brings us to the second fact. Young, developing tissue (fruits, leaves, tubers) may receive very little water from the transpiration stream, especially when the plant's overall demand for water is high. Putting these two facts together suggests why calcium deficiencies, setup by slow movement of water to young tissue, are most often thought to cause BER, tipburn, and IBS. Management of BER, tipburn, and IBS must take into account that the movement of water and calcium in a plant are closely related.

Tips on Minimizing the Occurrence of BER, Tipburn, and IBS. Physiological disorders are difficult to correct. Once symptoms are visible, corrective measures often are not economically viable. Therefore, focus on prevention. A number of steps may be taken to minimize the occurrence of BER, tipburn, and IBS. First, plant resistant varieties. It is well known that some varieties are more prone to develop these disorders. Exactly why is not understood and is a fertile area of study (this will also be discussed in a later article). Consult Cooperative Extension and seed trade publications and representatives for information on varietal susceptibility to physiological disorders. It is also important to manage soil pH and fertility based on soil tests. Soil pH should be close to neutral (7.0). Nutrients should be present in adequate levels and in appropriate ratios. For example, it is often suggested that calcium be present at twice the level of magnesium and that magnesium be present at 1.5 times the amount of potassium. Appropriate liming programs usually provide enough calcium for plant growth (dolomitic lime also contains magnesium). But, there is some evidence that soluble calcium applied to the region containing developing potato tubers may reduce the occurrence of internal brown spot.

Blossom-end rot may be more likely to develop when ammoniacal nitrogen is used since ammonium ions may limit calcium uptake by the plant. Maintaining soil moisture at optimal levels is another important step in reducing the occurrence of physiological disorders. Interruptions in calcium and/or water supply are especially damaging to young fruit, leaves, and tubers. Maintaining optimal soil tilth may also help reduce the onset of calcium-related physiological disorders. Calcium is taken up by young root tips. Compacted or poorly aerated soils limit root growth and, therefore, calcium availability. Also, it may be worthwhile to consider harvesting before the occurrence of BER, tipburn, or IBS increases dramatically. Fewer or less damaged harvested units are easier to cull, require less labor to do so, create fewer breakdown problems, and increase crop marketability. Scout the crop regularly as it approaches maturity and weigh the advantages of delaying harvest against the disadvantages of a greater incidence or severity of physiological disorders. Finally, foliar applications of calcium-containing fertilizer rarely prevent or correct BER or IBS. As will be discussed later, calcium applied to foliage does not move to areas where BER or IBS occur. Frequent calcium-containing sprays directed to young fruit may not limit the incidence or severity of BER. In some cases, tipburn may be reduced by foliar calcium applications.

For More Information

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